Alg. 2 Warm Up # 9-4

1. Give the exact radian measure for each angle:

a) 90^o b) 30^o c) 120^o d) 330^o e) 135^o

2. Give the exact degree measure for each angle:

a) $\frac{\pi}{4}$ b) $\frac{5\pi}{3}$ c) $\frac{3\pi}{4}$ d) $\frac{7\pi}{6}$ e) 3π

What about:

1) $\frac{15^o}{1} \cdot \frac{\pi}{180^o}$ 12

$\boxed{\frac{\pi}{12}}$

2) 420^o

3) $\frac{4\pi}{15} \cdot \frac{180^o}{\pi}$ 12

$\boxed{48^\circ}$

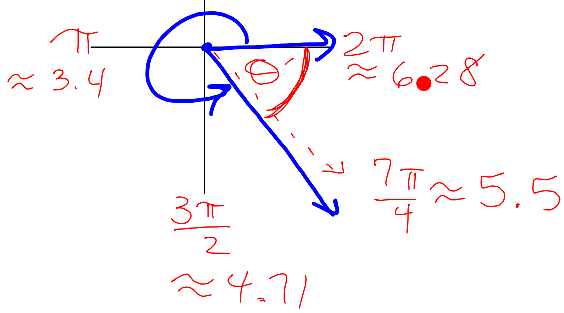
4) $\frac{9\pi}{5}$

HW Questions:

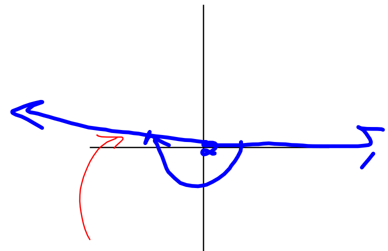
18) 5.2

$\theta' \approx 6.28 - 5.2$

$\theta' \approx 1.08$



20) - 3.2



$\theta' \approx 3.2 - 3.14$

$\theta' \approx 0.06$

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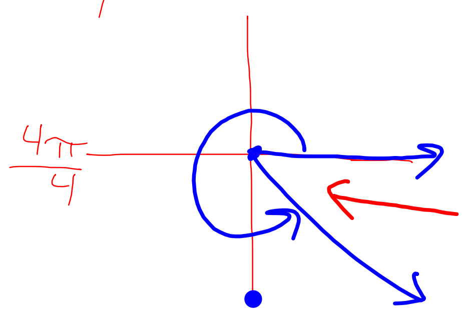
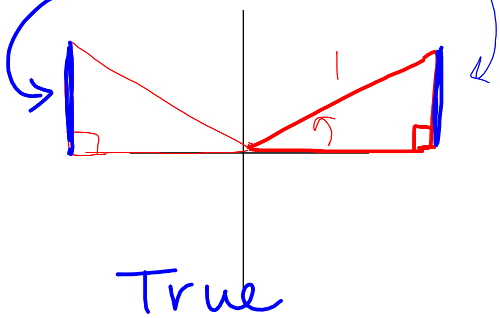
14) $\frac{7\pi}{4}$

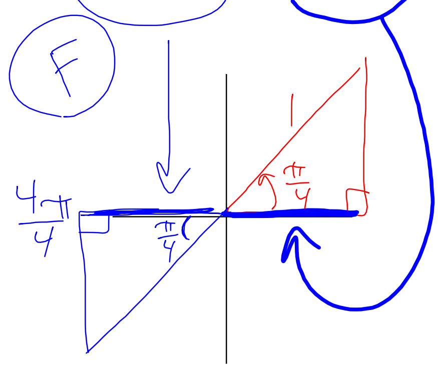


$\theta' = \frac{\pi}{4}$

27) $\sin\frac{7\pi}{9} \stackrel{?}{=} \sin\frac{2\pi}{9}$

25) $\cos\frac{5\pi}{4} \stackrel{?}{\neq} \cos\frac{\pi}{4}$



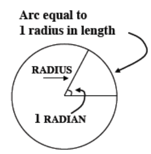


True

$\cos\frac{5\pi}{4} = -\cos\frac{\pi}{4}$

Blue CP's

7-72. HOW TO MAKE A RADIAN



Imagine wrapping the radius of a circle around the circle. The angle formed at the center of the circle that corresponds to the arc that is one radius long has a measure of exactly one **radian**.

Your teacher will provide each member of your team with a different-sized circular object and some scissors.

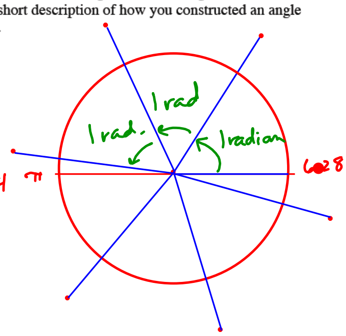
a. Trace your circular object onto a sheet of paper and carefully cut out the circle. Fold the paper circle in half and then in half again so that it is in the shape of a quarter circle, as in the diagram at right. How can you see the radius of your circular object in this new folded shape?

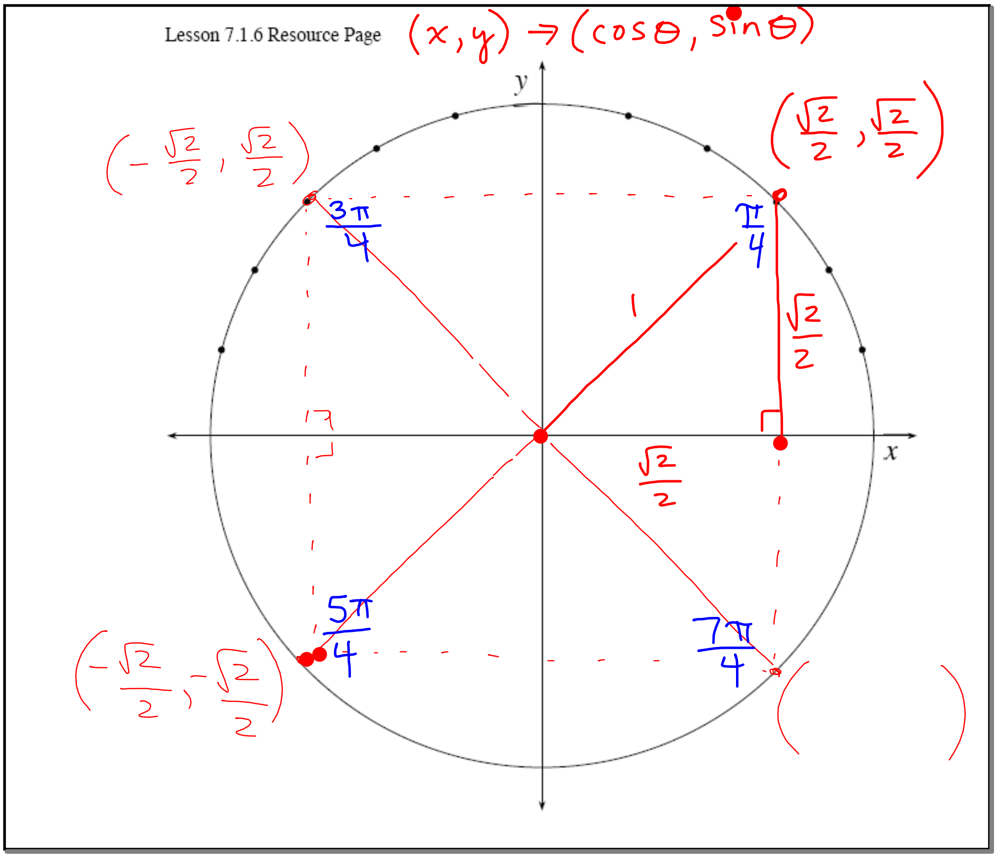
b. Place your circular object onto another sheet of paper and trace it again, only this time leave the circular object in place. Roll (or wrap) a straight edge of your folded circle around your circular object and mark one radius length on the traced circle. Then mark another radius length that begins where the first one ended. Continue marking radius lengths until you have gone around the entire circle.

c. Remove the circular object from your paper. On your traced circle, connect each radius mark to the center, creating central angles. Each angle you see, formed by an arc with a length of one radius, measures one **radian**. Label each of the radius lengths and each angle that measures one full radian. Write a short description of how you constructed an angle with measure one radian.

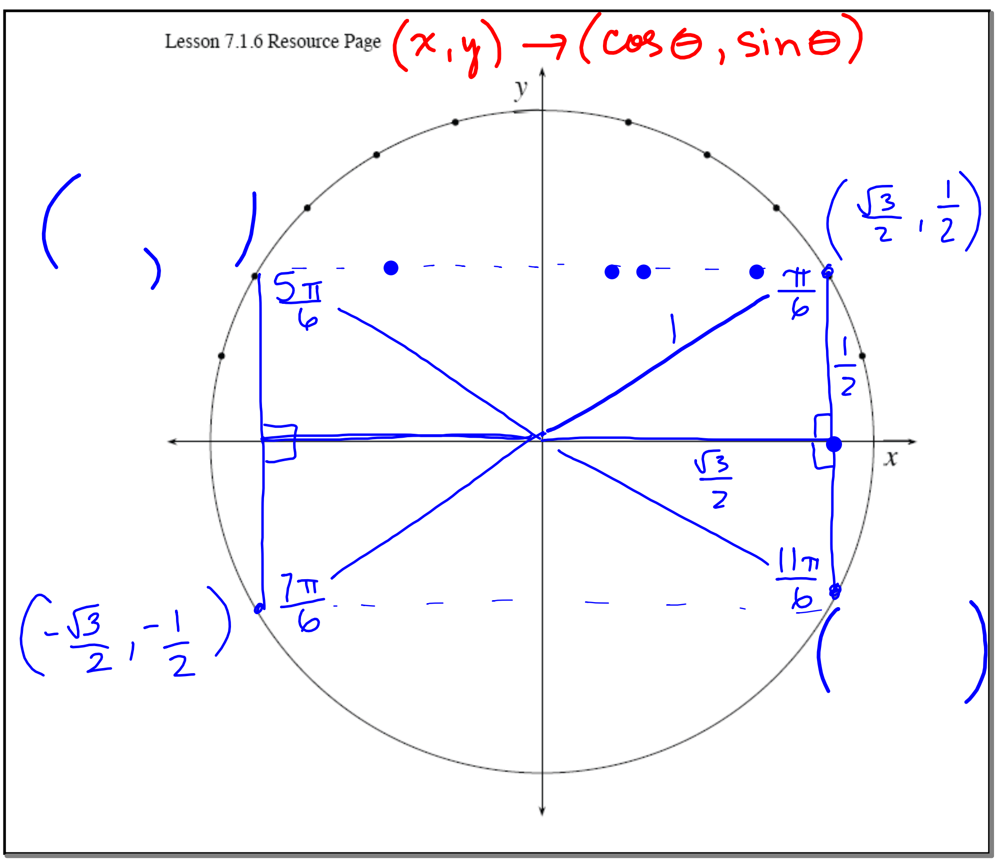
$1\,\cancel{\text{rad}} \cdot \frac{180^\circ}{\pi\,\cancel{\text{rad}}}$

$\boxed{1\text{ rad} \approx 57.3^\circ}$ 3.14 π

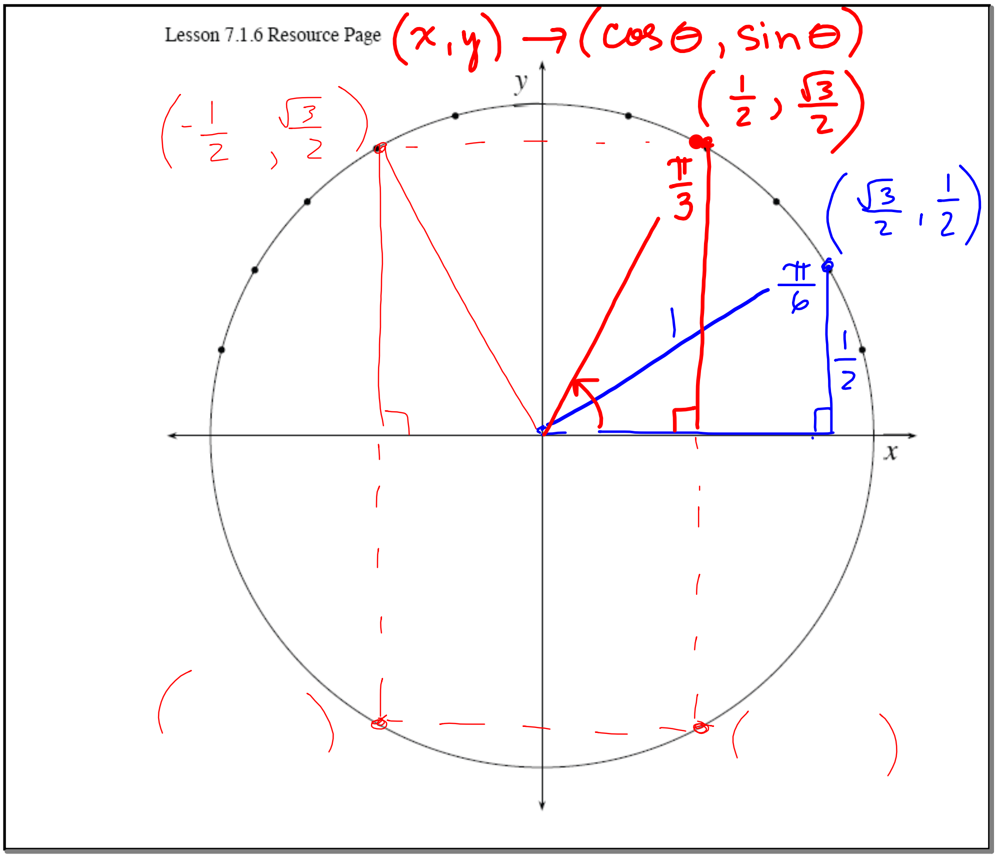


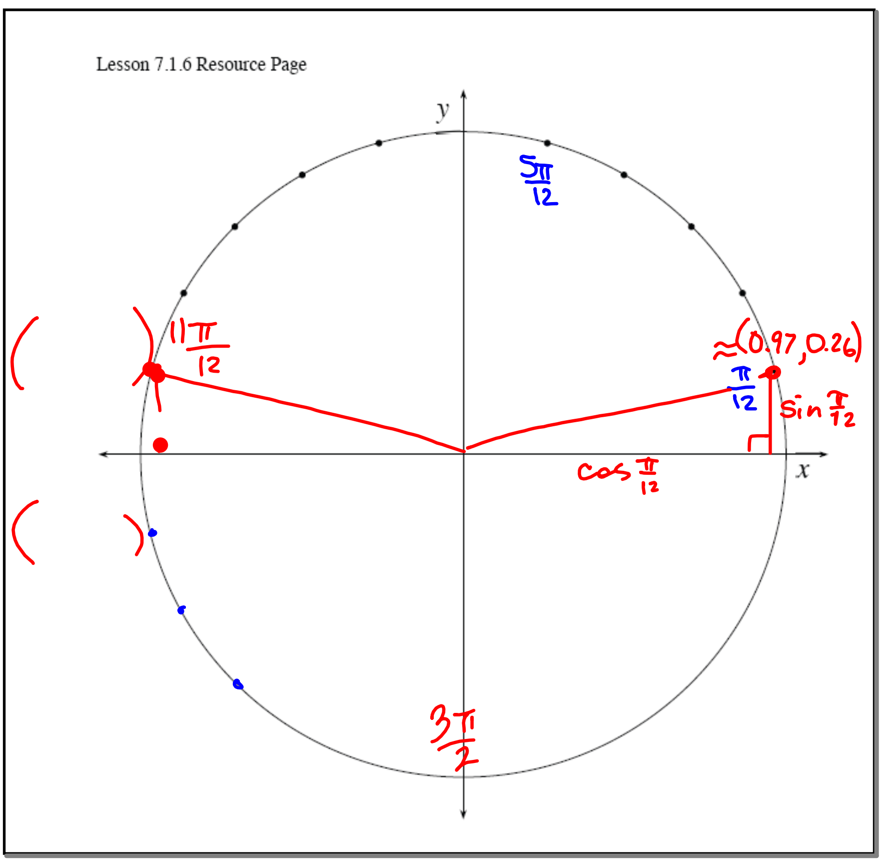


Lesson 7.1.6 Resource Page
(x, y) → (cos θ, sin θ)
y
x
(√2/2, √2/2)
(−√2/2, √2/2)
(−√2/2, −√2/2)
3π/4
π/4
5π/4
7π/4
1
√2/2



Lesson 7.1.6 Resource Page
(x, y) → (cos θ, sin θ)
y
x
(√3/2, 1/2)
(−√3/2, −1/2)
5π/6
π/6
7π/6
11π/6
1
1/2
√3/2


Lesson 7.1.6 Resource Page
(x, y) → (cos θ, sin θ)
y
x
(1/2, √3/2)
π/3
(√3/2, 1/2)
π/6
1
1/2
(-1/2, √3/2)


Lesson 7.1.6 Resource Page
y
x
5π/12
11π/12
≈(0.97, 0.26)
π/12
sin π/12
cos π/12
3π/2

CP's: 7- #99 ---> 103 (white WS & graph) p. 341

7.1.7 What is tangent?

The Tangent Function

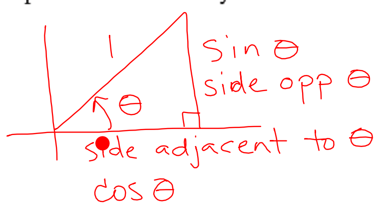
In the past several lessons, you have used your understanding of the sine and cosine ratios to develop and interpret the functions $s(\theta) = \sin\theta$ and $c(\theta) = \cos\theta$. In this lesson, you will expand your understanding by exploring the tangent ratio and graphing the function $t(\theta) = \tan\theta$.

a) $\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{\sin\theta}{\cos\theta}$

7-99. Jamal was working on his homework when he had a brilliant realization. He was drawing a triangle in a unit circle to estimate the sine of $\frac{\pi}{10}$, when he realized that this triangle is the same kind of triangle that he draws when he wants to find the slope of a line.

a. How could you express the slope of the radius in terms of sine and cosine?

b. Is there any other way you can use a trigonometric ratio to represent the slope? Discuss this with your team.



$\tan\theta = \frac{\text{opp}}{\text{adj}}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\boxed{7-101}$ a) Complete the table:

$\tan\theta = \frac{\frac{1}{\cancel{2}}}{\frac{\sqrt{3}}{\cancel{2}}} = \frac{1}{\sqrt{3}}$

$= \frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{\sqrt{3}} = \frac{1}{\sqrt{3}}$

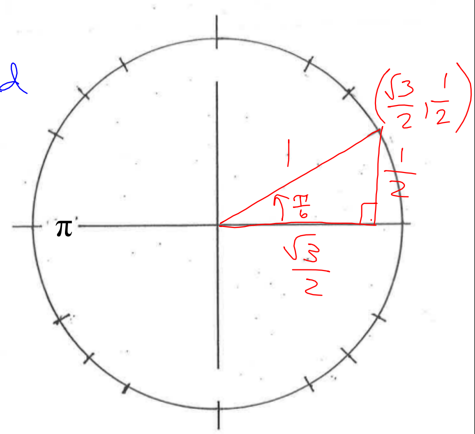
Radians θ	Exact $\sin\theta$ (y)	Exact $\cos\theta$ (x)	Exact $\tan\theta$	Approx. $\tan\theta$
0	0	1	0	
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$	0.58
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$			
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$			
$\frac{\pi}{2}$	1	0	undefined	

2 ways to calculate
① → $1 \div \sqrt{3}$ ② $\tan\left(\frac{\pi}{4}\right)$

Draw Δ's on the unit circle below to figure out slopes ($\tan\theta$)

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\tan\frac{\pi}{2} = \frac{1}{0}$



7-100. THE TANGENT FUNCTION

Obtain the Lesson 7.1.7 Resource Page from your teacher. Use your knowledge of sine, cosine, and tangent to create a graph of the tangent function. Conduct a full investigation of the tangent function. Be prepared to share your summary statements with the class.

Discussion Points

Does every angle have a tangent value?

How is the tangent graph similar to or different from the sine and cosine graphs?

Why does the tangent graph have asymptotes?

Further Guidance

7-101. For each triangle in the first quadrant of the unit circle on your resource page, label the sine and cosine.

a. Use your knowledge of tangent to complete a table like the one below. Start with the exact values for the sine and cosine.

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$ (exact)	$\tan\theta$ (approximate to nearest 0.01)
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$	
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$		
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$		

b. Plot the tangent values on the graph to the right of the unit circle.

c. Draw five new triangles that are congruent to the first five, but that are located in the second quadrant. Add values for these new angles to your table and your graph.

d. Continue this process by drawing triangles in the third and fourth quadrants. You should have a total of twenty triangles drawn and twenty angle values on your graph. If you have not done so already, add data to your table and points to your graph corresponding to the intercepts of the unit circle.

7-102. Investigate the tangent graph by analyzing the following questions:

a. Describe the domain and range of the tangent function.

b. Describe any special points or asymptotes.

c. Does it have symmetry? Describe any symmetry you see in the graph.

d. How is the graph of $t(\theta) = \tan\theta$ different from the graphs of $s(\theta) = \sin\theta$ and $c(\theta) = \cos\theta$?

Further Guidance section ends here.

7-103. Draw a new unit circle and label a point that corresponds to a rotation of $\frac{\pi}{6}$ radians.

a. What are the coordinates of this point? Use exact values.

b. Use this information to find each of the following values without a calculator. (Hint: Drawing each angle on the unit circle will be very helpful.)

i: $\tan\left(\frac{7\pi}{6}\right)$ *ii*: $\cos\left(\frac{13\pi}{6}\right)$ *iii*: $\tan\left(\frac{2\pi}{3}\right)$

Go back through your CP's and finish things up!

Week 9
Warm Up
7- #71 ---> 76 (blue)
7- #86 ---> 89
with Unit Circle
7- # 99, 101-103
with tangent graph

HW: 7-

#104 ---> 112

Short Quiz Friday:
Solving Quadratics all three ways.
Changing Radians <---> Degrees.

EC: Something from the Unit Circle